1 TASK 3: PACKAGING REUSE

1.1 INTRODUCTION

The Packaging and Packaging Waste Directive (94/62/EC), alongside setting targets for recovery of packaging, encourages the establishment of reusable packaging systems. Article 5 of this Directive states that “Member States may encourage the reuse of packaging...”

Encouragement of reuse was written into the Directive due to the potential of reuse to be an effective packaging waste minimisation measure. At that time few studies had considered the broader environmental impact of reuse, but many observers felt that reuse probably offered environmental advantages. Despite this conceptual support for reuse, in practice many reusable packaging systems were in decline. To give a few examples of the societal changes that occurred during the twentieth century that placed pressure on reusable packaging:

- International barriers to trade decreased, which meant that products came to be transported further, making refilling less feasible
- Consumers grew accustomed to a wider choice of products
- The spread of new forms of shopping such as supermarkets increased the importance of product presentation and branding: reusable packaging sometimes looked less desirable than single-trip packaging
- Consumer lifestyles changed – for example women moved into the workforce and most households no longer had a person dedicated full-time to household work – which meant that some consumers became resistant to having to wash, store and return packaging, which meant that trip rates declined
- Packaging technology developed so that single-use alternatives to traditional reusable packaging sometimes offered greater perceived advantages to the customer (for instance light, easy to carry, unbreakable PET bottles seemed preferable to some consumers compared to traditional reusable glass bottles which could almost double the total weight of a unit of beverage).
- Labour costs increased while material and energy costs fell in relative terms, meaning that single-trip packaging tended to become comparatively cheaper than reusable packaging.
Towards the end of the twentieth century, however, reusable packaging gained renewed support in some sectors for its perceived environmental and societal benefits, and regulators became concerned at the decline in reusable packaging. As a result several member states sought to introduce measures to protect existing reuse systems and encourage new ones. These measures tended to be aimed at consumer packaging, but over the last decade reuse has also increased (from a level that was already higher than the public probably realised) in industrial and transit packaging.

The figures below show trends in the usage of reusable and single-trip packaging for beer and soft drinks in Western Europe from 1998 to 2007 (future years are projections). The figures show that the market share of reusable glass bottles (the black bands in the figures) is gradually declining. The market share of PET bottles is growing.

1.2 THE PARAMETERS DEFINING REUSE

1.2.1 A model reuse system

An instructive example of a reuse system which was found to be environmentally and economically successful – and which was relatively uncontroversial in that all stakeholders agreed it was environmentally and economically viable – was the British system of household delivery of milk using refillable milk bottles. The reasons for its environmental and economic success were found to be as follows:

- Return rates were high (20-25 trips, or a return rate of approximately 95-96%). The bottles were part of a controlled loop system; consumers had to return empty bottles to have more milk.

---


10 Boustead, 1990
delivered, and they did not need to make much effort to return bottles (they placed the bottles on their doorsteps for the deliverers to exchange for filled bottles). Bottle survival rate was high because of the optimised nature of the closed loop system.

- Milk production was localised. The sturdy glass milk bottle caused increased transport impacts compared to lightweight one-trip alternatives, but since transport distances were small, this disbenefit was relatively small.

- Milk did not require extensive branding or information on the bottle. Milk bottles had no labels and so the refilling facility did not need to wash off old labels or affix new ones. The situation of different brands competing for consumer attention in a retail environment did not exist, and so milk bottles did not need to look enticing for marketing purposes.

- The local delivery and take-back system was energetically efficient: delivery involved the use of electric vehicles, and take-back of empty bottles did not require extra transport.

- The float (the extra number of bottles the system required to allow for the bottles held by fillers, retailers and consumers, and also to allow for peaks in demand) could be relatively small because milk was consumed quickly and demand was relatively stable.

Despite these environmental advantages, since the study was undertaken the use of the refillable milk bottle has been on the decline in Britain (it currently has 20% of the market)\(^\text{11}\). Consumers are increasingly choosing to buy their milk in one-trip packaging from supermarkets. This is said to be due to lifestyle changes. For example, there is often no one at home during the day to receive the milk, and milk left on the doorstep all day may have soured or been pilfered by evening. Increasingly time-pressed consumers tend to find it convenient to buy milk along with other supermarket purchases, and increasingly appear to find it inconvenient to rinse bottles and place them outside. Household sizes (in terms of the number of people living together) have become more variable, which means that some consumers require smaller or larger amounts of milk than that delivered by the standard milk bottle (568ml, 1 pint). Supermarket efficiencies mean that milk bought in supermarkets tends to cost less.

So the British milk bottle provides a good example of the strengths and weaknesses of reuse systems. Reusable packaging tends to be most environmentally and economically successful when it exists as part of a suitable product supply system. The question of whether reusable packaging is environmentally, economically or socially preferable is dependent more on the features of the society in which the packaging system exists than it is on the features of the packaging itself. This is why the many LCAs that have been undertaken in this area have often been unable to reach conclusions or reach opposing conclusions. The findings of such studies are dependent on the parameters and assumptions that are made about logistical and societal features such as transport distances and return rates. If these features are separated out, studies tend to be in agreement to a greater extent than first appearances might suggest. Studies which assume low transport distances (ie localised production, distribution and consumption) and high return rates (usually achieved through tightly-controlled distribution systems such as industrial systems or mandatory consumer systems) tend to show that reusable packaging systems are environmentally and economically desirable. Studies which assume lower return rates and longer transport distances tend to show that one-trip packaging is preferable. In the middle ground, studies which assume high return rates and low distribution distances or vice versa, or which assume moderate values for both, often tend to reach inconclusive results; not because the studies are flawed but because the environmental (and, often, economic) differences between the competing packaging systems are insignificant. All stakeholder experts with whom reuse was discussed during the preparation of this study

\(^{11}\) INCPEN, 2004, pers comm.
agreed on this general trend. Opinions differed as to where the ‘break-even’ point might be, but the differences of opinion were not insurmountably large.

1.2.2 Key parameters in existing LCA-based studies

A review of selected pertinent studies helps to enable estimations to be made of the ranges for which reusable packaging may be environmentally superior, one-trip packaging may be environmentally superior, or the picture is unclear.

The German UBA project - LCA for Drinks Packaging - produced two reports, I and II. UBA I was published in 1995 and covered drinks packaging for fresh milk and beer, and UBA II was published in 2000 and covered drinks packaging for mineral water, carbonated soft drinks, juice and wine.

The packaging systems used in study I were:

<table>
<thead>
<tr>
<th>Packaging systems studied in UBA I(^{12})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging systems for fresh milk (capacity 1 litre)</td>
</tr>
<tr>
<td>Cardboard composite (brick type)</td>
</tr>
<tr>
<td>Cardboard composite (gable top)</td>
</tr>
<tr>
<td>Returnable glass bottles</td>
</tr>
<tr>
<td>PE bag</td>
</tr>
</tbody>
</table>

The study found that, for milk, the one-trip polyethylene bag had the lowest environmental impacts in most categories, closely followed by the reusable bottle system. Both of these were found to offer lower impacts than the two carton packaging systems for milk. For beer, the reusable bottle system was found to be environmentally superior to the other non returnable systems with which it was compared. The study was based on specific situations in which refill systems exist, such as localised product distribution systems with low transport distances. The annual report of the Bundesumweltamt 1996 stated: “The results of the LCA study for drinks containers show that a general preference for returnable systems over non returnable systems is not always justified from an environmental point of view.”

The basic findings of the UBA II study, as stated in a presentation\(^{13}\) at the DG Environment/EUROPEN LCA workshop, were that the “eco-profiles of reusables and non-reusables are substantially different”. In the case of reusables, distribution and bottle rinsing cause the main impacts, whereas for non-reusables, production of packaging and packaging material dominates the ecological impacts. For all packaging systems, the results were found to correlate well with cumulated energy demand. In other words, the energy use of a packaging system was found to define of its environmental performance.

A summary by the Federal Environment Agency and UBA\(^{14}\) stated that the results of the interpretation showed the following picture:

---


\(^{13}\) UmweltBundesamt, LCA for Drinks Packaging, DG Environment / EUROPEN LCA Workshop 20 June 02

\(^{14}\) http://www.europen.be/issues/lca/LCA_workshop/Presentations/UBA%20II%20Summary.doc
• For mineral water, non-carbonated drinks and wine, assessment using the method outlined above revealed no comprehensive environmental advantage or disadvantage for the existing refillable glass bottle systems and the existing carton packaging systems

• For mineral water and carbonated refreshment drinks, the existing refillable PET bottle systems were preferable to the existing refillable glass bottle systems from an environmental viewpoint

• For carbonated refreshment drinks, throw-away glass bottles as well as tinplate and aluminium cans were found to be distinctly less environmentally favourable than comparable refillable systems

The report concluded that “reusable bottles manufactured from glass or plastic PET are both ecologically advantageous. In contrast, one way glass bottles and beverage cans manufactured from aluminium or tinplate are particularly disadvantageous in ecological terms.”

The report’s conclusions were criticised in some quarters for not appearing to align completely with the findings shown in the body of the report. For example, according to the European Aluminium Association, the actual results of the study showed that out of the nine environmental impact categories examined, four categories gave a better result for aluminium cans than for refillable packaging, in four others aluminium was worse and in the last both were equal15. Another paper16 pointed out that the data used were several years out of date by the time the study was published and the weight of the 330ml steel can for drinks had been reduced by 13% and the recycling rate had risen from 64% to 80% between the time the data were collected and the report published. According to Europen, the European Aluminium Association analysis of the UBA II case demonstrated that “in reality only minor differences between one-way and refillable packaging were shown and these differences were even smaller than the margins of error of the assessments”.

The conclusions originally published by Prognos AG17, stated that

15 http://www.eaa.net/downloads/Parliamentmag.pdf

16 http://www.feinstblech.de/fileadmin/Download/Publikationen/oekobilanzen_en.pdf

17 Conclusions published by Prognos AG in October 2002 following the last results of phase II of the UBA II project “LCA for drinks packaging”. http://www.apeal.org/Contents/Enviroment/PROGNOS.pdf
• Reuse systems are not more ecologically preferable than one way systems
• The differences in ecological impact of the various packaging systems for drinks largely depend on packaging capacity and transport distances in distribution (reusable glass systems have lower ecological impacts than one way systems where distribution distances are small but with increasing distances this position is reversed). For reuse systems, trippage rates are also important.

Despite the differing interpretations that may be drawn from the UBA studies, the results do provide some clear broad findings.

Looking specifically into the issue of transport distances, the study found that refillable 1.5-litre glass bottles used for localised distribution of mineral water in Germany were environmentally preferable to one-trip PET bottles when the transport distance was less than 193km on average. The distance varied depending on the environmental parameter measured, the lowest being 117km when considering eutrophication and the highest being 520km in the case of summer smog. When considering energy – generally agreed to be one of the most important measures – the ‘break-even’ distance was 293km. The simple unweighted average of the various distances for the various impacts was 193km. One-trip PET bottles were environmentally superior in every measured respect when transport distances were over 1100 km. When considering smaller 0.7 litre bottles, the results were similar: break-even points varied between 238km and 558km.

The study assumed that the refill systems functioned optimally and return rates were high (which was often the case in the closely-controlled German refill systems). Returnable glass bottles are relatively heavy and bulky and so they can require almost twice as many trucks on the road to ship the equivalent amount of product as one-trip PET bottles; therefore it seems sensible that even when refill systems function well there is a point at which transport burdens mean that one-trip PET bottles achieve lower environmental impacts. The study suggested that the point at which refill systems cease to be the environmentally preferable option lies somewhere in the order of magnitude of approximately 100 to 1000 km: broadly speaking, this means that local product systems have the potential to be suitable candidates for refill systems that are environmentally beneficial, the situation with national systems is generally borderline (and probably only clear on a case by case basis), and international systems are unlikely to facilitate reuse systems that make environmental sense. This ties in with personal communications with German refill experts who have estimated informally that 500 to 800km might be the upper transport distance for environmentally and economically feasible refill systems. In responding to the Luxembourg case in 1996, the Commission reported that the supplied LCA data only supported refillable packaging for beer if transport distances were less than 100km. The LCA provided to the EC by Germany calculated 750km as the maximum feasible distance for refillable bottles. All these widely varying studies and diverse opinions, then, support the contention that the break even point lies in the order of magnitude of 100 to 1000 km.

Most successful German refill systems seem to be remarkably local. According to the GDB the average transport distance for refillable glass bottles is just 90km, and German LCA data provided to the European Commission assumed a maximum transport distance of 241km. These successful refill systems are, therefore, specialised systems designed for localised products.

---

18 German Refill Alliance, 2004, *pers comm.*
A Finnish study conducted in 1995\textsuperscript{19} comparing glass bottles, aluminium cans, PET bottles and steel cans concluded that the role of transport is significant for glass bottles. The study also concluded that “there is hardly a clear winner in the comparison between different beverage packaging options.”

A large study carried out by the Danish Ministry of Environment and Energy examined the potential environmental impacts associated with different existing or alternative packaging systems for beer and carbonated soft drinks in Denmark. The study compared refillable and disposable glass and PET bottles along with aluminium and steel cans. The energy demand, potential global warming, acidification, nutrification and photochemical ozone formation were found to be significantly lower for the refillable glass bottles than for the disposable glass bottles for the same size due to the fact that the recycling of glass was found to demand more fuel and electricity than washing and filling of refillable bottles. The differences in the potential global warming, photochemical ozone formation, acidification and nutrient enrichment between the refillable glass bottles and the 330ml aluminium can were not significant.

### Environmental ranking order of existing or alternative systems with 330ml packaging for beverages that are filled and sold in Denmark

<table>
<thead>
<tr>
<th>Environmental impacts</th>
<th>Refillable glass bottle</th>
<th>Disposable glass bottle</th>
<th>Aluminium can</th>
<th>Steel can</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global warming</td>
<td>1-2</td>
<td>2-4</td>
<td>1-3</td>
<td>3-4</td>
</tr>
<tr>
<td>Photochemical ozone</td>
<td>1-2</td>
<td>2-4</td>
<td>1-3</td>
<td>3-4</td>
</tr>
<tr>
<td>Acidification</td>
<td>1-2</td>
<td>3-4</td>
<td>1-2</td>
<td>3-4</td>
</tr>
<tr>
<td>Nutrient enrichment</td>
<td>1-2</td>
<td>3-4</td>
<td>1-2</td>
<td>3-4</td>
</tr>
</tbody>
</table>

In 2001, TNO conducted a study for APEAL which compared a number of European key studies regarding the LCAs of several one-trip and refillable beverage packaging systems. TNO recalculated the results of the different studies to the same basic unit in order to allow comparison between the studies to be made. A further TNO study commissioned by APEAL\textsuperscript{20} conducted a sensitivity and eco-efficiency analysis. The German UBA II study was used as a reference as it contained the most complete and transparent data. TNO examined a number of LCA parameters. These included:

- Weight of the primary packaging
- Transport distance between filler and retailer or point of sale
- Percentage of secondary material used
- Trip rate (number of cycles per bottle) for refillable packaging systems
- Trip rate (number of cycles per pallet) for transit packaging systems
- Waste disposal options (percentage waste going to incineration versus percentage going to landfill)
- Composition of beverage cartons

\textsuperscript{19} Mälkki H et al. Life cycle assessment of environmental impacts of Finnish Beverage packaging Systems. Pakkausteknologiaryhmä ry1995

\textsuperscript{20} Ansems AMM and Ligthart TN. LCA sensitivity and eco-efficiency analyses of beverage packaging systems. TNO report R 2002/179. May 2002
Combining costs with environmental impact allowed the following eco-efficiencies of the systems as shown in figure [to be added] to be obtained. Systems above the AB line show relatively high eco-efficiency compared to those below the line. The group above the line includes cans, refillable bottles and beverage cartons whereas one way bottles appeared to have lower eco-efficiency. There is however a significant amount of overlap between the systems.

[a large amount of stakeholder input has been received on the topic of reuse including several more key studies: discussion of these will be included here in the next draft report]

### 1.2.2.1 Non-consumer reusable packaging

There are undoubtedly more re-usable packaging systems in existence than many consumers realise, because the societal and distributional features that suit re-usable packaging exist more often within industrial and commercial operations than in consumer situations. For example, bread, vegetables and beverages are distributed in refillable transport packaging relatively often (mainly plastic trays and crates). Goods are often shipped on re-usable wooden or plastic pallets. Industrial chemicals are often transported in re-usable bulk crates and tanks. Car parts and similar engineering products are frequently shipped in specialised re-usable packaging. For example Ford Australia reported that changing from four litre cardboard cases to reusable injection moulded plastic bins saved the disposal of approximately 500 corrugated cases per day equivalent to around 30 tonnes per year\(^1\). Some medicines are delivered to hospitals and doctors’ surgeries in re-usable, foldable plastic crates\(^2\). These reuse systems are successful environmentally and financially for a wide variety of reasons. For example they are part of a tightly-controlled closed loop and return rates are often exceptionally high, transport distances are often relatively short and the appearance of the packaging tends to be unimportant.

A project performed by Ecobilan in 1997-1998 for the Spanish Foundation of Plastics and Environment compared the environmental performance of reusable plastic trays versus one-way corrugated trays for the transportation of yoghurt\(^3\).

The results of the analysis emphasised the critical role of the following parameters:

- Weight
- Trip rate
- Transport distance
- Backloading of empty crates (reverse distribution)
- End of life treatment

Other parameters which had a significant role were:

- Distribution environment
- Turnover
- Filling speeds
- Space utilisation
- Shelf filling
- Transit damage

---

\(^1\) Monash Centre for Environmental Management. Economic and environmental benefits of reusable transport packaging: Case studies and implementation guidelines. April 1999

\(^2\) GlaxoSmithKline, 2000, pers comm.

\(^3\) Teulon H. Life Cycle Assessment of Returnable versus Non Returnable Transport Packaging Systems. Ecobilan
• Product and pack size and shape
• Cost of investment
• Brand and marketing decisions

The results indicated that longer transport distances favoured single trip packaging whereas shorter transport distances and increasing number of rotations favoured the returnable system. These are of course the same parameters defining the success of consumer refillable packaging: reusable transit packaging and one-way transit packaging each has a role depending on the distribution logistics involved.

A study undertaken for the Association of Swiss Corrugated Board Manufacturers24 and vetted by BUWAL and EMPA showed that the break even transport distances below which reusable transit packaging had the potential to be environmentally preferable where between approximately 90km and 700km. (The range is large because a variety of goods and reusable packaging systems were investigated, but notice how closely this range mirrors the ranges that other studies have found for primary packaging.)

A study carried out for FEFCO25 investigated a typical distribution system for transporting fruit and vegetables from Holland to Germany and extrapolated its findings to include longer transport distances. It found that reusable and one-trip transit packaging had similar environmental performance when transport distances were up to 500km, after which one-trip transit packaging was preferable. The study found that, irrespective of distance, one-trip packaging was always cheaper in purely financial terms (a broader social cost-benefit analysis was not undertaken). A similar study looking at fruit and vegetable distribution in France26 found that reusable trays necessitated 65% more trucks on the road than one-trip trays, due to extra bulk and reverse distribution, so it is not difficult to see that reusable transit packaging is most effective when distribution systems are localised.

24 Wagner and Partner SA, 2004, Corrugated Board is a Truly Clever Solution, IWIS, 2004


26 Emballage Ondule de France, 2004, Corrugated and Environment
1.2.2.2 Trip rates

The collection rates and number of trips achieved by refill systems can vary widely depending on how successfully closed the refill loop is. Industrial systems by their nature achieve the highest return rates. For example, reusable wooden pallet pool systems (such as the widely-used CHEP system) last for well over 100 trips (although wooden parts are replaced as they break, making it somewhat difficult to define when a pallet is still the original pallet). Plastic trays used for supermarket distribution of produce and suchlike are similarly estimated to last for approximately 100 trips (there are seven million of these reusable trays in use in Britain alone, so the importance of non-consumer reuse systems should not be underestimated).

Trip rates for consumer refill systems are lower, since it is more difficult to control consumer behaviour and ensure that refillable packaging is returned without fail. For example, refillable glass bottles may be broken or used for storing paint by consumers, reusable plastic shopping bins used by a leading British supermarket are all too often reused in an unintended way as toyboxes and toolboxes, and the ‘bag for life’ reusable plastic shopping bags offered by UK supermarkets are reported to suffer a remarkably low reuse rate because customers tend to treat them as single-use bags. A range of studies looking into refillable bottle trip rates in member states where taxation, significant deposits or other legislative measures were generally lacking concluded that the trip rates were between 3 and 4. A refillable glass soft drink system that was replaced by one-trip bottles in Britain and Ireland in the 1980s suffered a trip rate of 1.1 at the time the manufacturer abandoned the refill system: in other words, only one bottle in ten was even returned once.

These examples show that in the real world return rates can be low if conditions are not optimal for ensuring return of reusable packaging. Consumer refill systems require strong efforts to control return and ensure successful closed loops. Some of the best examples of such well-controlled consumer refill systems exist in Germany and Scandinavia, where return rates range from 84 to 95 per cent according to German Refill Alliance measurements. In Finland a study found trip rates for beer and soft drinks to be between 25 and 32 (96 to 97 per cent). Another study investigated reuse rates for a variety of European beverage containers and found trip rates of 10 to 42 (90 to 98 per cent). Even in member states where consumers tend to support the refill concept and impressive trip rates are achieved, there have been instances where return rates have plummeted as soon as some aspect of the control system faltered – industry groups point to recent instances when return rates have fallen to 50 per cent (a trip rate of 2). (The rates became so low because it seems that increasingly some consumers are beginning to treat refillable bottles as though they are single-trip bottles, merely for the sake of convenience.) A UK study found that in a reasonably well controlled system (that of refillable beer and soft drink bottes used in the pub trade, a system that has now all but disappeared), the bottles were reported to achieve 14 trips in the case of beer and 9 in the case of soft drinks; this equates to return rates of approximately 92% and 89% respectively. The Body Shop, a retailer that offers an in-store refill service for its cosmetics bottles, is said to have found that 2 per cent of its UK customers, 4 per cent of its German customers and 6 per cent of its Scandinavian customers make use of its refill service.

---

27 CHEP, 2000, pers comm.
29 Major UK-based beverage retailer, pers comm
30 Andreas Golding, 2002, Reuse of Primary Packaging
31 INCPEN, 2004, pers comm.
Return rates are a significant issue, because LCAs often show that refill systems only maintain their environmental advantage when refill rates are high. LCAs tend to use ‘optimal real world’ refill rates of around 84 to 95 per cent or theoretically achievable rates of around 95 to 99 per cent. Therefore, where studies show that refillable packaging offers environmental advantages, in the real world any problems in the system have the potential to jeopardise these advantages.

1.2.2.3 Float

Many of the LCAs reviewed appear to ignore the issue of the float required by reusable systems. Refillable bottle systems need extra bottles to allow for the bottles held at each point in the distribution and reverse-distribution system. Extra bottles are also required to cope with peaks or cycles in demand (for example a system for soft drinks must have enough bottles to cater for summer peaks in consumption). There appears to be little data available on how big this float needs to be, but what data there are suggests that it is significant: in a USA study for beer and soft drinks, the float was 37%, and in a Canadian refillable bottle system, for each bottle purchased by the consumer, on average five more bottles were held in the household (either full awaiting consumption or empty awaiting return) and four more bottles were in the distribution system. Because LCAs often fail to explicitly deal with this issue it is unclear how such extra bottles could be accounted for in an LCA study. However, to give an illustrative rough assumption, if the float was assumed to be 37% and half of that was assumed to be full bottles that were equivalent to full bottles in a one-way system and could therefore be ignored, and half of the remainder were assumed to be incurring only half of the full life cycle impacts, then one possible way to account for the float would be to make 1 unit of a one-way bottle functionally equivalent to 1.14 units of a re-usable bottle. This would in effect raise the refillable bottle impacts by some 14%. This would exceed the benefit found in some studies.

1.2.2.4 Capital impacts

LCAs generally do not include capital costs. So the environmental impact of building extra warehousing at retailers and fillers to store and process empty refillable bottles is not accounted for. This is not a criticism of LCA system boundaries; clearly it is appropriate that capital issues are considered to be beyond the scope of LCAs in most cases. However since the purpose of this study is to investigate the impact of increasing the use of reusable packaging systems in Europe, in the real world rebuilding retailer and filler premises will have an environmental impact and so this issue merits brief discussion.

As with many issues associated with reusable packaging, the key issues are societal ones rather than anything directly associated with the physical nature of the packaging itself. In members states such as Germany, soft drinks and beer are often purchased by consumers in crate lots: twelve units are bought in a (reusable) plastic crate, sometimes at drive-in retail outlets so that consumers can drive their cars straight into the point of collection and avoid having to carry the heavy crates. This is a very different situation from many member states, where consumers tend to buy bottles singly, for a variety of reasons. In some member states, consumers may not always have had the disposable incomes to buy twelve bottles at once. In others, high population density has led to a greater incidence of shopping on foot and carrying purchases home on foot. Increasingly, consumers have reason to buy drinks in single-serve sizes for consumption soon after purchase rather than at home. For these and many other societal reasons, there may be limits to how far the ‘buy crate by car’ purchasing model can be adopted across Europe. (An additional point, of course, is that since a reasonably fuel-efficient car uses around 2 megajoules of energy per kilometre, a drive of several kilometres to collect a crate of beverages would negate the energy saving achieved by the use of refillable bottles.)

Retailers in high population density areas tend not to have the space to cater for refillables in some member states. For example in the south-east of England, where population density, land values and construction costs are all considerably higher than the EU average, retailers have been particularly vocal in their opposition to any requirement to build extra warehousing to cater for refillable bottles.
Another capital issue is that of reusable bottles themselves: the cost of acquiring a stock of refillable bottles is significant.

The capital costs associated with refill systems can lead to entrenched positions: companies that have a refillable bottle stock, warehousing, washing facilities and the necessary logistics tend to want to keep using them to protect their investment, and those that have not invested in such infrastructure tend to resist the suggestion that they should invest in it.

### 1.2.2.5 Other financial issues

[This section remains to be developed. Considerable quantities of useful stakeholder input was received in the three days before this draft had to be circulated, and this input will be incorporated in the next draft. In general, the information received to date tends to suggest that single-trip packaging is all too often cheaper than reusable packaging, and the economic advantage of single-trip packaging is, if anything, growing – which is one of the main reasons why reusable packaging systems are under pressure. However it is clear that reusable packaging can be cheaper in specific cases. The situations in which reusable packaging offers economic benefits will be examined.]

### 1.2.2.6 Other social issues

[As with the rest of the report, social issues currently form the least developed area of the reuse section. The assessment methods being developed for the rest of the report will be applied here. Stakeholders have indicated that they regard employment as a major social issue for reusable packaging. Data examined to date suggest that operators of reusable packaging systems create employment at a rate that exceeds the employment lost from single-trip packaging industries. The scale of this benefit will be assessed.]

### 1.2.2.7 Non-LCA environmental impacts

There are qualitative environmental issues that are outside the scope of LCA-type studies of packaging that nevertheless may be significant.

Littering can be a significant issue in terms of public perception. It could be argued that littering is not a function of packaging but of society: packaging does not create litter, people do. However, reusable packaging tends to be less visible in litter than one-trip packaging and this is an environmental advantage valued by some observers. (One stakeholder has commented that this benefit may be more about perception than reality, since broken glass bottles appear similar whether or not they are refillable. There is also said to be anecdotal evidence that more injuries occur in countries that have more refillable glass bottles, due to the greater incidence of broken glass litter.) While opinions vary, most observers agree that reusable packaging is less involved in litter to some extent. This is an environmental benefit of refillables that is not shown by LCA-type studies.

Another non-quantitative advantage offered by reusable packaging is that it has the potential to encourage environmentally-responsible consumer behaviours. Because reusable packaging requires a little more effort (for example in carrying, washing, storing and returning it) than one-trip packaging it has the potential to encourage consumers to be more conscious of their consumption. It may have the potential to make them think about their choices and about buying local products. However, this should be kept in perspective because there are of course other forms of encouragement that may more directly support better environmental behaviour, such as higher taxes on low-fuel-efficiency cars or on fuel itself. (Some industry stakeholders have said that they dispute the idea that reusable packaging encourages environmentally-responsible behaviour: they are unconvinced that refillable packaging is environmentally beneficial and so they take the view that consumers should not be misled by ‘green tokenism’.)
1.2.3 What key parameters mean

It is clear from the many studies that have been undertaken and the views of stakeholders and experts that reusable packaging and one-trip each offer environmental advantages depending on the societal and logistical context in which they exist.

Reusable packaging systems are a result of the societal context in which they operate, not a cause of it.

An investigation into the potential to extend the use of reusable packaging, then, must investigate the incidence of suitable societal conditions in Europe. There appear to be little data available, so estimations must be made.

If society wishes to see reusable packaging grow beyond its current feasible market, society must adapt its product supply systems. Reuse systems cannot be ‘bolted on’ to unsuitable product supply systems: the issues are more fundamental than that. For example:

- Product manufacture would have to become more localised, reversing the trend towards larger (and, it is claimed, more efficient) production facilities that rely on long distance transport logistics to get products to markets.

- Consumers would have to lessen their reliance on imported products and might have to accept different price structures in some cases due to differing manufacturing and labour costs in various parts of the world (for example it has been calculated that electrical goods would double in price if the lower cost bases of growing economies could not be exploited).

- Food supplies would change and consumers would have to accept greater seasonality of produce.\textsuperscript{32}

In short, the Western lifestyle would require adapting to a lesser or greater extent. This is clearly not a short term issue. There are no known cases of society changing the way in which it produces goods, transports them and uses them in order to facilitate the use of reusable packaging. However, despite the challenging nature of the issues that would have to be faced to greatly increase the success of reusable packaging, the issues are worth mentioning because they are central to the debate about sustainability. Environmentalists at the more radical end of the spectrum feel that if society is to achieve sustainability it must become more localised, less globalised, more reliant on local production, less urbanised and more reliant on smaller social units. Such a vision of sustainability is of course anathema to large businesses which thrive in the modern free-market globalised economy.

To some extent the polarised opinions received from stakeholders during the preparation of this study reflect this diversity of thought. There are those who believe that reusable packaging is inherently desirable and ethical. These tend to be:

\textsuperscript{32} Transport 2000, 2003, \textit{Wise Moves} report
− Environmentalist pressure groups
− Consumers who have grown up in member states where reuse is traditional
− Businesses that have considerable investment in reusable systems
− Businesses that do not relish the thought of extra competition from distant competitors.

Then there are those who believe that reusable packaging is outdated, expensive, inconvenient and a barrier to trade. These tend to be:

− Consumers who have grown up in member states without reusable packaging systems
− Businesses with long-distance product distribution systems
− Recycling organisations that are reliant on a supply of one-trip packaging
− Businesses that wish to avoid the capital expenditure of setting up reusable packaging systems
− Businesses that rely on unique or innovative packaging for marketing purposes.

These differences of opinion have close parallels with the differences in opinion that exist concerning free market economics: the non-interventionist, free market Anglo-American point of view versus the somewhat more controlled, slightly more interventionist Germanic point of view. (Neither free market ideology is inherently better or worse, although it is recognised that some environmentalists believe that the more interventionist approach may offer greater potential to lead to a more sustainable society – a view that is disputed by others.)

The point is that no study can provide answers that are acceptable to everyone when stakeholder opinions are divided by political ideology. However, some of the findings of this study would seem to be undeniable common sense: reuse systems work best over short distances and in specific societal/logistical situations, and it is these societal situations that must change if reusable packaging is to be encouraged in a meaningful manner.